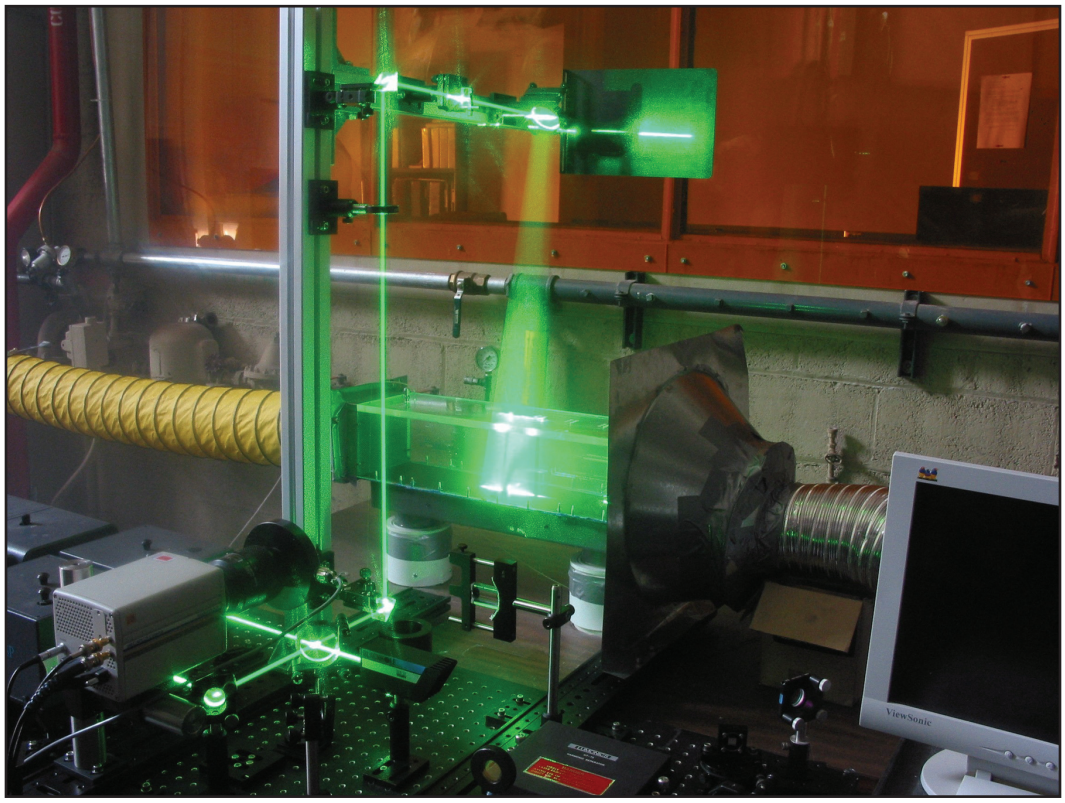
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

SUCCESS STORY

AFRL LASER DIAGNOSTIC TOOL ASSISTS NEXT-GENERATION ENGINE DEVELOPMENT



AFRL and Rolls-Royce engineers used a laser diagnostic tool--the Particle Image Velocimetry (PIV) measurement technique--to collect critical validation data for computer design codes that will drive the next generation of engine development. AFRL's goal is to transfer advanced technology to industry, government agencies, and military services.

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Accomplishment

The engineers used PIV techniques to complete a study of jet penetration into cross-flow airstreams. They successfully tested six configurations of varied cross- and jet-flow rates with two different plate-hole geometries, collecting data for each configuration at multiple planes of view. The team used consecutive images from a high-speed camera to correlate particles seeded into the cross- and jet-flow fields. To determine the related velocities, they measured the travel distance of the seed particles in a given time frame, and they acquired three PIV data sets at each condition. The engineers collected spreadsheets of test parameters and run conditions from a data acquisition system that documented each test. Test results indicated a positive correlation between the PIV data and expected results. The team also noted the achievement of visualization of jet penetration and mixing.

Background

AFRL is studying PIV technology and its applications to engine development by conducting basic and applied research programs to enhance the development of turbopropulsion systems. Laboratory researchers are also establishing existing and theoretical component performance and durability capability through the evaluation and integration of aerodynamics, heat transfer, material application, and other design factors.

Propulsion
Emerging Technologies

Additional Information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (PR-S-05-07)